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CONTENTS

Page

Classification of the Female Pelvis
Howard C. Moloy, M.D., M.Sc. 131

Surgical Shock
Norman W. Roome, B.A., M.D., F.A.C.S. 141

Vitamins K and P
Dave State, '39 145

The Living Neurone
Murray L. Barr, M.D. 149

Subclinical Scurvy
E. L. Brown, '40, and J. D. Galloway, '40 156

The Neuroses
Morton Golden, B.S., Meds. '40 165

Abstracts 170

Editorial 173

Book Reviews 174

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Classification of the Female Pelvis

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THE obstetrical importance of the size and shape of the female pelvis has been known for many centuries. Early workers recognized and accurately described the marked pelvic abnormalities caused by rickets, osteomalacia, spinal deformity, and other pathological processes. In certain localities throughout the world today such extreme abnormalities continue to cause serious forms of dystocia. In incidence of these pathological pelves, however, is rapidly decreasing due to the improved medical care extended to infants and children during the important years of bone growth. However, in localities where the rachitic pelvis may be considered an obstetrical curiosity, there exists a definite incidence of operative deliveries due to disproportion, soft part resistance, or to pelvic abnormalities of a type not caused by any of these well known forms of bone pathology. It is toward this type of abnormality that obstetrical interest is directed at the present time. The etiological factors responsible for these so-called non-pathological types of pelvic deformities are not clearly understood. They seem to be related to racial characteristics, developmental and familial inherited factors, to the overlapping of the sexual characteristics, or, in other words, to the influence of certain hormones upon bone growth during infancy, childhood, and adolescence.

This concept of the etiological factors concerned with pelvic abnormalities as well as the anatomical description of variations in pelvic shape are the results of an investigation instituted at the Sloane Hospital for Women six years ago. The investigation was begun by Dr. W. E. Caldwell because he believed that certain pelvic types, not adequately described in obstetrical texts, played an important role in the cause of dystocia and increased the difficulty encountered in operative delivery.

During the early months our study was directed to the large collection of skeletal material at the American Museum of Natural History,

New York; the U. S. National Museum, Washington; the Hamann Museum of Western Reserve University, Cleveland; and the Department of Anatomy, College of Physicians and Surgeons, New York. It soon became apparent that the accepted obstetrical classification of pelves failed to give a true concept of the marked variation in pelvic shape which existed in skeletal material. This suggested the need for roentgenologic study of the pelvic form in living women. Hitherto no use had been made of roentgen methods of examination at the Sloane Hospital so far as pelvic shape or size was concerned. The use of stereoroentgenograms was advised, and we were thereby gratified with the three-dimensional visualization of the pelvic cavity from the inlet to the outlet.

THE TECHNIQUE OF PELVIORADIOGRAPHY

Having demonstrated the superiority of stereoroentgenograms, we realized that certain improvements in the technique to allow the visual study of a three-dimensional image and at the same time to permit measurement of the cardinal pelvic diameters would increase the practical value of the examination. For instance, it was found that in the ordinary stereoscope it was possible to vary the size of the stereoscopic image markedly by slight changes in the angle of the reflecting mirrors. As a result, it was difficult to determine the true size of the pelvis, even though its shape was accurately reproduced. While experimenting with methods to enable us to observe a true pelvic image, we conceived the idea of recording the cardinal diameters of the pelvis by carrying a measuring ruler into the pelvic image directly under stereoscopic vision. Further experimentation proved the practicability of this method, which in itself was already known as the measurement of the "phantom image." The principle was originally suggested by Deville. Complicated stereoscopes were devised by Trendelenberg and others which, though accurate, were not practical for general use. Accordingly we designed a special stereoscope and made certain additions to the technique of taking stereoroentgenograms to ensure the correct placment of the films in the viewing-box of the stereoscope. This latter objective was accomplished by the use of a casette frame which marks the periphery of the film with the image of arrow markers for placement over corresponding lines on the celluloid edge of the viewing surface. The full-silver surfaced mirrors were replaced by half-platinized mirrors to allow direct measurement of the "phantom image" under stereoscopic vision. The optical system was equipped with rhomboids to adjust for variations in individual interpupillary distances. The finished model is called a *precision stereoscope* because by its use the trained observer can carry an ordinary measuring rule into the pelvic image and measure directly any desired pelvic diameter at any level in the pelvic. One objective of the investigation was thus accomplished, namely, a roentgenologic technique giving a three-dimensional

image of pelvic shape and of the relationship of the head to the pelvic inlet and at the same time enabling the observer to measure the cardinal pelvic diameters. In each instance a lateral film of the pelvis (preferably the standing lateral) is obtained and also a view of the subpubic arch.

Pelvic shape can be studied by means of the ordinary stereoscope but errors in film interpretation may occur, due to the inability of the observer to accurately determine pelvic size. Accordingly, if the ordinary stereoscope is used, the lateral film should be taken by a technique which permits measurement of the true conjugate diameter by a method advocated by Thoms and others.

THE CLASSIFICATION OF THE FEMALE PELVIS FROM THE STANDPOINT OF MORPHOLOGY

At first the inspection of skeletal material revealed such marked variations in the shape of the pelvic inlet that a classification according to type did not seem feasible, but with greater experience in the study of pelvic morphology, it became evident that certain pelves conformed to one of four characteristic inlet shapes, namely, the *long narrow oval*, the *round*, the *flat*, and the *wedge-shaped* types. A large number of pelves appeared to conform to intermediate shapes between these extreme types. It seemed advisable to consider these four characteristic extreme shapes as standard or parent types and to devise a terminology which would not only designate these types but would be flexible enough for combinations with each other to designate the equally important borderline forms.

A review of the literature revealed that Weber in 1830, and von Stein in 1844, had recognized these four groups but had not considered the borderline types. Turner, in 1885, described three of these four groups but failed to suggest the wedge-shaped type and, like Weber and von Stein, did not attempt the classification of the borderline groups. The long narrow oval type appeared to resemble the pelvis of the anthropoid apes, and Turner, considering this type a primitive form, had shown it to be more commonly found in primitive races. The round type conformed to the classical female pelvis. The wedge-shaped pelvis simulated the appearance of the male pelvis. Berry Hart recognized and described this type as the sexually inverted pelvis. The flat pelvis, though frequently confused with the wedge-shaped form, presented no difficulty of recognition to these earlier workers. All this information enabled us to suggest the following terminology for these four standard types:

(1) The anthropoid type, resembling the long, narrow, oval pelvis of the anthropoid ape.

(2) The gynecoid type, showing all the well-known architectural characteristics of the normal female pelvis.

(3) The platypelloid type. This pelvis has a wide or transverse oval appearance.
(4) The android type, which bears a morphological resemblance to the human male pelvis. The inlet is wedge-shaped or blunt heart-shaped.

The use of one of these terms by itself indicates a parent pelvic type in which the *combined* shape of the anterior and posterior segment conforms to the classical longitudinal oval (anthropoid), the round (gynecoid), the transverse oval (platypelloid), or the wedge-shaped (android) type of inlet. Many pelves are, in shape, borderline types containing characteristics of each of these four parent groups. In the analysis and description of these we have found that great help is obtained if we divide the pelvis into an anterior and posterior segment not only at the outlet, as is commonly done, but also at the inlet and in the cavity. This division is accomplished by passing a coronal plane through the widest trensverse diameter of the inlet and the interspinous diameter. The posterior segment may conform in shape to one standard type and the anterior segment to another. By suitable combinations the terminology suggested for the parent forms may be used to describe these borderline types. The first term describes the shape of the posterior segment and the second term indicates the shape of the anterior segment. The ultimate classification of many individual cases is, however, dependent upon the shape of the pelvic inlet as a whole rather than upon the shape of either the anterior or posterior segment. Thus the term "anthropoid-gynecoid" is intended to designate a borderline type between the anthropoid and gynecoid type which is a long *wide* oval in shape. The "gynecoid-flat" is a normal pelvis with a *flat* tendency at the inlet. The "anthropoid-gynecoid" and "gynecoid-flat" borderline type, *along with their respective parent forms*, denote a cycle of change in pelvic form from the longitudinal narrow oval through a round type to a transverse oval or flat shape.

Certain mixed types of pelves may show in addition masculine characteristics in the posterior pelvis, as evidenced by a narrow sacrosciatic notch or a narrow fore pelvis to form a *long narrow wedge-shaped* inlet, a *flat wedge-shaped* inlet, or a *blunt heart-shaped* inlet. These borderline android forms are described by the terms "android-anthropoid," "android-flat" or "android-gynecoid."

The term "platypelloid," originally suggested by Sir William Turner, is too cumbersome for use. Accordingly, it is used to designate the flat group of pelves which show variable degrees and types of flattening at the inlet, such as the "gynecoid-flat," the "android-flat," and the "true-flat pelvis."

Below the pelvic inlet the shape of the pelvic cavity may change, as the outlet is approached, through variations in the splay of the side walls and the curvature and inclination of the sacrum and symphysis. A decrease in transverse capacity may be caused by convergence of the

side walls or variations in the length of the ischial spines. The subpubic arch may be wide, moderate, or narrow, but the size of the arch may or may not vary directly with the degree or type of side wall convergence. As a result a narrow subpubic arch may be associated with a wide intertuberous diameter, or, on the other hand, an equally narrowed subpubic arch may be found with a narrow intertuberous and interspinous diameter.

Variations in the transverse and longitudinal curvature and in the inclination of the sacrum have as important effects on lower posterior pelvic capacity as the character of the side walls and the subpubic arch have upon anterior pelvic capacity. The inclination of the sacrum is shown by the angle subtended between the plane of the inlet and the surface of the upper two or three sacral segments. The inclination may be forward, average, or backward. A line drawn from the ischial spines to the sacrum, parallel to the plane of the inlet, gives an index of posterior pelvic capacity at that level (posterior sagittal diameter of the second parallel plane). The lower sacral region, along with the coccyx and its ligamentous supports, forms a platform under the ischial spines, the so-called sacrococcygeal platform. From the practical standpoint it is important to gain information relevant to the level of this region to the spines and the position of the sacral tip in relation to the ischial spines (posterior sagittal diameter of the third parallel plane).

All these anatomical variations can be determined with fair accuracy by clinical examination of the pelvis. The clinician carefully palpates the subpubic arch, determines the slope of the side walls down to the ischial tuberosities, and notes the character of the ischial spines and the relationship of the sacrococcygeal platform to the ischial spines. At higher levels the upper sacral region or sacral promontory may be palpable. Under such circumstances the application of the facts gained from the palpation of the lower pelvis to the supposed shape of the inlet will reveal the pelvic type within a practical degree of accuracy. The clinical recognition of a pelvic abnormality justifies a roentgenologic examination in order that the obstetrician may gain a detailed knowledge of the shape and size of the pelvic cavity in each individual case.

The anthropoid type, as Turner pointed out, is more commonly found in the negro race. The android type is more frequently observed in the white race. The platypelloid type, though rare, is twice as common in the white race as in the black.

SUMMARY OF CLASSIFICATION AND DESCRIPTION OF THE PELVIS

I. The anthropoid type (pure or parent type) — large, average or small.

II. Intermediate or mixed types between the anthropoid and gynecoid types — large, average, or small: anthropoid-gynecoid type.

III. The gynecoid type (pure or parent type) — large, average, or small.
IV. Intermediate or mixed types between the gynecoid and platypelloid (flat) types — large, average, or small: gynecoid-flat type.
V. The platypelloid type (pure or parent type) — large, average, or small.
VI. The android type (pure or parent type) — large, average, or small.
VII. Intermediate or mixed android types — large, average, or small: (a) android-anthropoid; (b) android-gynecoid; (c) android-flat.
VIII. Asymmetrical pelves.
IX. The pathological pelvis (rickets, ostemalacia, congenital anomalies, and deformities due to sacroiliac and spinal disease, etc.).

In addition to a complete description of the pelvic cavity from inlet to outlet, the lengths of the cardinal pelvic diameters should be given as obtained by roentgen pelvimetry: as, for instance, the true conjugate diameter, the widest transverse diameter of the inlet, the interspinous and the intertuberous diameter. The intertuberous diameter may be obtained by the precision stereoscope since the widest space just above the tuberosities of the ischium is easily located.

In each individual pelvis the following regions of the lower pelvis must be described in detail:

(a) Subpubic arch — wide, moderate, narrow.
(b) Pubic rami — straight or curved (Gothic or Norman arch effect).
(c) Splay of side walls — divergent, straight, or convergent.
(d) Fore pelvis — well formed or funnel-shaped.
(e) Character of the ischial spines — long and narrow, or flat on a broad base.
(f) The sacrosciatic notch — wide, average, or narrow masculine type.
(g) The sacrum — a general concept of length, width, curvature, and number of segments.
(h) Sacral inclination — forward, average, backward.
(i) Lateral bore — straight, convergent, or divergent.
(j) The posterior sagittal diameter, at the inlet, at the level of the ischial spines and at the level of the sacral tip and the relationship of the sacrococcygeal platform to the plane of the ischial spines.
(k) Shape of the outlet in front of the sacral tip.

Finally the pelvis should be studied as a whole to determine whether it is well formed or angular, irrespective of the gynecoid, android, anthropoid, or flat character of the pelvic inlet.

Obstetrical prognosis and the management of labor depend upon a number of factors, the more important of which deal with the questions of whether the head *will* descend and of *how* the head descends. The question of whether the head *will* descend concerns the problem of disproportion between the size of the head and the pelvic inlet.

Disproportion between the head and the pelvis, to even a major degree, is occasionally observed in spontaneous deliveries, especially in multiparous women. The incidence of variable degrees of disproportion increases in the low forceps, low-medium and medium forceps, and Caesarean section groups. The disproportion, in most instances, can be readily observed from the study of the stereoroentgenograms in the precision stereoscope by visually attempting to compare the head and its biparietal diameter with the available space present at the inlet or in the lower pelvis. The observer experienced in the use of the precision stereoscope can actually measure one or more cardinal diameters of the fetal head besides noting the amount of clearance between the head and the pelvis. Flexion and moulding of the head in labor decrease head size and represent such variable factors that attempts to reduce the degree of existing disproportion to simple mathematical terms have not given satisfactory practical results. Although a roentgenological examination may reveal the pelvic type and the presence of a large head, a trial of labor becomes the best means for determining the correct significance to place upon this supposed degree of disproportion.

The question of *how* the head descends when the pelvis is abnormal has considerable practical significance, especially in regard to the ease or difficulty encountered in the use of certain recognized obstetrical manoeuvres, either manual or instrumental.

Average measurements on a group of anthropoid, gynecoid, or flat pelvic types will show a ratio between the anteroposterior and the widest transverse diameters which indicates a long narrow oval, a round, or a transverse oval shape. The characteristic wedge-shaped appearance of the android type, however, is not shown by the ratio between these diameters. Accordingly no attempts were made to compute average measurements since the results would not be significant in revealing pelvic shape.

The smaller the pelvis the greater is the chance of obstetrical difficulty. This well-known fact is shown by the increased frequency of small diameters from spontaneous deliveries to the Caesarean section group. But the high frequency of small diameters in low-medium and medium forceps cases shows that small diameters do not preclude the possibility of safe delivery through the natural passages. Safe delivery under such circumstances may depend upon the efficiency of the forces of labor or the use of mechanical skill in operative deliveries when the pelvis is abnormal. It is for this reason that interest is directed toward pelvic shape in relation to recognized obstetrical manoeuvres.

PRACTICAL SIGNIFICANCE OF PELVIC SHAPE FROM THE STANDPOINT OF FORCEPS DELIVERIES

Most experienced obstetricians have encountered examples of arrest of the head in the transverse or occipitoposterior position in which anterior rotation by manual or instrumental methods is difficult or

impossible to obtain. We have found that with arrest of the head in one or the other of these common positions the obstetrician can effect delivery to mechanical advantage if he is aware of the individual peculiarities of the shape of the inlet and the mid and low pelvis.

TRANSVERSE ARRESTS

Most obstetricians of experience have perfected their own methods for the treatment of transverse or occipitoposterior arrest of the head. In our clinic we have been favorably impressed by the use of Barton forceps, especially in the treatment of transverse arrest of the head. Barton forceps may be used to rotate the head at the level of arrest or to effect descent to lower levels in the position of arrest. If it is desirable to bring the head to a lower level, the head is made to descend by lateral flexion following the curve of the lower sacrum and sacrococcygeal platform. By this act the influence of the posterior pelvis which resists anterior rotation is removed and rotation can be easily accomplished on the inner aspects of the pubic rami or with caput in sight below the subpubic arch.

Two types of pelves are characteristically responsible for the ease of this mechanism — the android with straight side walls and the flat type of pelvis. In the android pelvis, resistance to anterior rotation is offered by the flat posterior pelvis. The presence of straight side walls indicates good transverse diameters throughout the lower pelvis. The act of anterior lateral flexion will frequently effect actual descent without the use of strong axis traction force. After anterior rotation has been accomplished, Barton forceps are removed and the delivery is terminated by the cephalic application of pelvic curved forceps.

In the classical flat pelvis the transverse oval at the inlet is preserved throughout lower levels by means of straight side walls and an average curvature and inclination to the sacrum. This transverse oval shape is predisposed to a transverse mechanism throughout the pelvis, which becomes more important for ease in labor the greater the degree of flattening, provided the inlet admits the head. Less trauma to mother and child results if the head is made to descend to lower levels in the transverse position in these flat forms. The pelvis may show variable degrees and types of flattening. Success in manual rotation of the transversely arrested head usually implies that an ample true conjugate diameter is present.

POSTERIOR ARRESTS

Thoms and others have drawn attention to the frequency of occurence of the occipitoposterior position in the anthropoid pelvis. This observation, of course, is correct, but the anthropoid pelvis is an efficient pelvis, and there is usually spontaneous rotation or arrest in the occipitoposterior position at a low level with caput in sight. However, with arrest at higher levels as in the medium type of forceps deliveries we have observed that the arrested posterior position is found not infre-

quently in android or in flat pelves. The long oval shape is present at midpelvis to encourage this position by the presence of either converging side walls in the android type or a backward sacrum in the flat forms.

The occipitoposterior arrest in android types and certain flat forms is delivered most satisfactorily by manual rotation to the transverse position followed by the application of Barton forceps. By lateral flexion and traction the head descends to a lower level in the transverse position where anterior rotation is accomplished similar to the mechanism described for the flat pelvis.

In the low-mid type with arrest of the head in sight or on the pelvic floor, however, we find that the occipitoposterior position becomes once more characteristic of the anthropoid pelvis. Descent of the head to the outlet usually implies good flexion and moulding. Accordingly, anterior rotation is much more easily carried out than would occur if arrest took place at a higher level. Complete forceps rotation (Scanzoni manoeuvre) may be employed with success under such circumstances, especially if the fetus is under average in size. Elevation with manual rotation of the well-flexed and moulded head also represents an excellent manoeuvre in anthropoid types.

A pelvic application of forceps to the occipitoposterior position with traction to a lower level may be used occasionally in certain anthropoid types associated with convergence of the side walls and a narrow subpubic arch. This manoeuvre should be used only if attempts at manual rotation at the level of arrest or at a higher level have failed. Descent to lower levels in the occipitoposterior position should not be attempted if the lower sacrum is forward. Occasionally the child may be delivered face to pubis but as a rule easy anterior rotation takes place spontaneously when the caput appears low down at the outlet.

ANTERIOR ARRESTS

Arrest in the anterior position as in the occipitoposterior type of arrest is associated with two common architectural features, i.e., an ample anteroposterior diameter and converging side walls with a decrease in the interspinous diameter. With anterior arrests a cephalic application of forceps is easily made and the degree of traction necessary to effect delivery is, to a certain extent, dependent upon the degree of convergence of the side walls. The widest biparietal diameter of the head descends through the intertuberous diameter in front of the narrowed interspinous diameter.

THE LOWER PELVIS AND OUTLET

Convergence of the side walls or variations in sacral curvature and inclination may effect a change in pelvic shape at and below the level of the spines so that pelvic shape in front of the sacral tip may be quite different from the shape of the inlet. As a result, a head which has descended in a position which is physiologic for the shape of the upper pelvis, i.e., the occipitoposterior position in certain extreme anthropoid types, may be maladjusted for delivery through the pelvic outlet.

Although convergence of the side walls is equal in importance to the lower sacral region, we have been especially impressed by the frequency with which the forward lower sacrum may offer resistance at the outlet. If a forward lower sacrum is present which has caused a flat outlet shape in conjunction with a wide intertuberous diameter, it may be advisable to deliver the head past the plane of the sacral tip in the transverse position even though the shape of the pelvis above this level may allow complete anterior rotation.

The observations described in this report with respect to the significance of pelvic shape and the mechanism of forceps deliveries were gained from the study of a series of 500 labors which were divided into five groups, i.e., spontaneous deliveries, low forceps, low medium forceps, medium forceps, and Caesarean section. Sixteen stillbirths were found in this unselected group of 500 case studies. The analysis of the faulty mechanisms used to effect delivery in these cases stresses the principles briefly described in this report, namely:

(1) Forceful attempts at anterior rotation in flat and certain android pelvic types should not be made or separation of the symphysis or stillbirth may result.

(2) The transverse mechanism to lower levels should be encouraged in these forms.

(3) Forceful attempts at anterior rotation in low occipitoposterior arrest in extreme anthropoid pelves are equally dangerous.

(4) The head should be elevated and rotated at a higher level or brought to a lower level in the occipitoposterior position.

(5) The shape of the pelvic outlet as influenced by narrow intertuberous or interspinous diameters transversely or the position of the sacral tip in the sagittal plane should be considered in the mechanism of delivery at this low level.

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Surgical Shock*

By NORMAN W. ROOME, B.A., M.D., F.A.C.S.

SHOCK is a peripheral circulatory failure which, in surgery, results chiefly from severe trauma or from operations. There are thus two principal classes of surgical shock: traumatic and post-operative. These are quite similar, differing only in the relative importance and the timing of the various etiologic factors concerned. The division of shock into "primary" and "secondary" types is now being discarded.

There has been much discussion of the cause and mechanism of shock. The older theories covered a wide range of possibilities, including vasomotor exhaustion, fat embolism, acapnia due to over-respiration, and many others. From studies during the war of 1914-18, however, it became accepted that the essential feature of shock was a diminished circulating blood volume, and a major theory, of "traumatic toxemia," was evolved by Cannon and Bayliss. This theory assumed the liberation into the blood stream of a toxic material, possibly histamine, from the damaged tissues; then diffuse capillary injury and increased capillary permeability; and finally a transudation of plasma through the damaged capillaries, causing a fall in blood volume and resulting in peripheral circulatory failure. These workers found that denervation of the part injured did not eliminate the resulting shock, and also thought that the local loss of fluid was inadequate to explain the subsequent effects.

While this theory persists to a considerable extent, the experts in the field have almost uniformly discarded it. Numerous experiments designed to demonstrate the toxic material have failed to do so, and in several laboratories an adequate local fluid loss has been found in the injured parts of experimental animals. Attention has also been repeatedly called to the large hidden blood losses which may occur in the human patient. For these reasons it is now thought that local fluid loss plays a very large part in initiating shock, possibly combined with various other factors. Toxins from the injured tissue of burns may be one of these contributing factors in the special kind of shock following extensive thermal injuries.

Although numerous workers have decided that nervous influences play a very minor part, or none at all, in traumatic shock, it must be admitted that the evidence for this is derived almost entirely from animal experiments which may not be entirely applicable to human cases. Experience has shown that pain, anxiety, and fear play a part in the production of clinical shock; and recently an ingenious theory of the mechanism of such effects has been suggested. These psychic stimuli, along with hemorrhage, dehydration and starvation, and expos-

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ure to cold, stimulate the sympathetic nervous system and the adrenals. This sympathico-adrenal discharge produces vasoconstriction, injury to capillaries by ischemia, then increased capillary permeability; and plasma loss occurs as outlined in the toxic theory. The evaluation of this mechanism is unsettled at present, but it seems likely that its importance lies in the contribution to shock rather than in the initiation of shock.

The pathology of shock is a generalized capillary injury. Petechial hemorrhages, tissue edema, and fluid collections in serous cavities result from the increased permeability. These changes are usually most marked in the gastro-intestinal tract and in the lungs, and the extent of their damage is related to the length of time during which the circulation was inadequate.

The current conception of shock is, therefore, that it is a condition of peripheral circulatory failure due to a continued reduction in the blood volume, and that a number of inciting and contributory causes exist, which vary in different cases. Local fluid loss is probably the most effective cause; whereas vasoconstriction, due to fear, pain, dehydration, etc., may be a contributory factor. The local fluid loss in operations consists of hemorrhage during the dissection, hemorrhage after closure, and local edema due to trauma. A pre-existing depressed circulation (as in old persons) or a concurrent toxemia (as in infections) or cachexia (as in malignancy) would also play an obvious part. Oxygen deprivation during anesthesia leads to further capillary injury. Death occurs by continuance of the "vicious circle" of decreased blood volume, capillary injury, loss of plasma through the capillaries, further decrease of blood volume, further capillary injury, and so forth. Hence promptness is essential in treatment.

The clinical features of shock are classical, namely, a falling blood pressure with a rapid thready pulse and collapsed veins, shallow respirations, cold moist skin (particularly in the extremities), and often a pale cyanosis. It must be noted that the blood pressure should not be used as the only index of the condition of the circulation, as it may be falsely high or falsely low. The arterial pressure may be kept up to approximately normal levels, in the presence of a dangerously diminished circulation, by vasoconstriction due to reflex activity or to drugs such as ephedrin. The low pressure of high spinal anesthesia represent the converse, being without much significance if not unduly prolonged. Examination of the patient's extremities for coldness, pallor, sweating, and cyanosis, is the most useful diagnostic method regarding the significance of a lowered pressure.

Differentiation of actual shock from cardiac and respiratory failure should be carefully made, on the basis of the syndrome mentioned above. Numerous post-operative depressions are miscalled shock when they are actually central failures. We must therefore try to prevent "shock"

from becoming a waste basket into which all mysterious post-operative deaths are discarded.

The management of shock is best done by prophylaxis. This includes relief from pain and anxiety, avoidance of dehydration and starvation, and minimizing operative trauma and anesthetic anoxemia. Adequate morphine for painful conditions, sedatives the night before operation, and care as to the conduct and conversation of all persons in contact with the patient, are important pre-operatively.

Drastic catharsis and unnecessary starvation should be avoided, and subcutaneous fluids may be desirable. The operation should be as rapidly performed as is compatible with careful surgery. It must be noted, however, that speed alone is not the thing; for a rough half hour operation may do as much damage as a meticulously careful procedure of an hour's duration. Time spent on careful ligation of bleeding points may be well worth while in preventing post-operative bleeding. Choice of an anesthetic is important; the use of local infiltration, or of an inhalation anesthetic which can be given with large proportions of oxygen, may considerably benefit the patient.

Post-operatively, the same prophylactic management should be continued in all major procedures. Parenteral fluids should augment the intake by mouth until 2,000 to 3,000 cc. per day can be taken by the natural route. Morphine and sedatives will be necessary for pain or restlessness. The patient should be kept warm. Post-operative oxygen inhalation is being used considerably and is, without doubt, beneficial, especially for the patients with some respiratory depression after their anesthesia.

The treatment of shock after it occurs is essentially the prompt and adequate replacement of the diminished blood volume. The best material is blood, and often large amounts (1,000 to 1,500 cc.) will be required. Gum acacia in saline may be used when blood is not obtainable, and is almost as effective. Glucose solutions have a more transient action, while normal saline is so rapidly lost as to be almost worthless, except to carry the patient along while the blood is being drawn for the transfusion. Saline may be actually harmful in serious shock as it may wash out more of the plasma proteins. The "blood bank" in which typed blood is stored in refrigerators for several days is being found very useful in large hospitals (as Cook County, Chicago), as a source of blood which can be used at once without the delay of typing, running Kahn tests, and so forth. The necessity for promptness cannot be overemphasized, as the capillary damage becomes irreversible if prolonged.

Other factors in treatment are the application of external heat, oxygen inhalation and lowering of the head to protect the vital centres. Vasoconstricting drugs, such as adrenalin, are useful only in the stage of acute collapse (while something more effective is being arranged), and may actually be harmful. Digitalis is probably harmful; strychnine is useless.

In summary, shock is due to a diminished blood volume caused by a number of possible factors, of which local fluid loss is an important one. The prevention of shock is discussed, and the treatment is essentially the prompt replacement of the lost blood.

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Vitamins K and P

By DAVE STATE, '39

WITHIN the last four years a number of new vitamins have been added to the already well-known group of six. It is hoped in this article to acquaint the reader with a few of the more important facts concerning two of these newer vitamins, namely vitamins K and P. As there is no close relationship between the two, they will be dealt with separately.

Vitamin K

While attempting to determine whether chickens could synthesize cholesterol, Dam noted subcutaneous and intramuscular hemorrhages in those fed on a low fat diet. The pathological findings were similar to those of scurvy, yet this new disease could not be alleviated by lemon juice or cevitamic acid (vitamin C). The other vitamins, namely, the B group (in the form of yeast and marmite), A and D (as cod liver oil) were also without effect. The condition, however, was cured by the fats of hog's liver and hemp seed. This led Dam to postulate the existence of a new fat soluble vitamin, which he named vitamin K.

Sources of Vitamin K and Chemical Properties

Dam found vitamin K in hog liver oil, cabbage, spinach and tomatoes. Cod liver oil, wheat germ oil, carotene, cevitamic acid and rye do not contain it. Subsequently Almquist showed that, of the grains, alfalfa meal proved to be the best source. At the Mayo clinic it was found that fish meal, particularly when allowed to putrefy, was an excellent source for this vitamin. It is extracted from its various sources by means of petroleum ether, the vitamin residing in the non-sterol fraction of the unsaponifiable fat.

As to its chemical nature little is known. The material is non-nitrogenous and it contains an aromatic nucleus. It is fairly heat stabile but alkali labile. Ultra-violet radiation destroys its activity. Its molecular weight is about 600.

Mode of Action and Clinical Application

Dam and co-workers found that chickens fed on a vitamin K deficient diet developed hemorrhagic tendencies, because of the reduction of the prothrombin level in their blood. Three days after vitamin K had been fed to deficient animals their blood prothrombin level became normal, and the hemorrhages ceased. Concerning the mechanism by which vitamin K affects prothrombin there is as yet little data. Schönheyder has demonstrated that vitamin K is present in the prothrombin of the normal chicken, but absent in the chicken which has the hemorrhagic disease.

method of quantitative determination of prothrombin in the blood, it was shown by Snell that bleeding in jaundice is due to a lowering of the prothrombin level of the blood. At the Mayo Clinic the effect of giving vitamin K, bile salts with vitamin K, and bile salts alone to patients with obstructive jaundice was determined. They found that in these patients vitamin K alone did not greatly alter the prothrombin content of blood, that bile alone increased it moderately, but that the two together markedly elevated the prothrombin level within twenty-four hours. Vitamin K, a fat soluble vitamin, needs bile for its absorption from the intestine. This fact accounts for the negative result obtained by using vitamin K alone on the above patients and the excellent results obtained when vitamin K and bile salts are administered simultaneously. The results obtained by giving bile alone can be explained by assuming that the bile aids the absorption of vitamin K present in the daily food of the patients. In a group of twenty-eight patients with obstructive jaundice who were given vitamin K and bile salts before and after operation, only eleven per cent bled post-operatively, none seriously. This was in contrast to fourteen patients who received no concentrate of vitamin K or bile salts, sixty-four per cent of whom bled after surgery.

Vitamin K with bile salts has been administered in cases of hemophilia, menorrhagia and metrorrhagia without success, for in none of these conditions is there any noticeable alteration in the prothrombin content of the blood.

Summary

Vitamin K is a fat soluble vitamin, found in greatest quantities in alfalfa meal and putrefied fish meal. Its absence in chicks results in hemorrhages beneath the skin in the muscles and viscera, because of lowered prothrombin level of the blood. In patients with jaundice, bleeding is due to a lowered prothrombin content of blood, and is materially alleviated by the simultaneous use of vitamin K and bile salts, the latter being essential for the absorption of the former from the bowel. The vitamin is not of use in hemorrhagic tendencies in which there is no alteration in prothrombin level of the blood—hence its failure as a therapeutic agent in hemophilia, menorrhagia and metrorrhagia.

Vitamin P

The cause of subcutaneous and visceral hemorrhages in an animal in which experimental scurvy has been produced was shown by Rusznyak and Szent-Györgyi to be due to increased capillary permeability. Cevitamic acid, they felt, had no effect on this pathological condition but a substance belonging to the flavone group of vegetable dyes, obtained from the Hungarian red pepper, was effective. To this material they gave the name vitamin P.

Distribution and Chemical Nature

Vitamin P is a water soluble vitamin found in the citrus fruits, particularly the lemon and in the Hungarian red pepper. It is a vege-

Distribution and Chemical Nature

Vitamin P is a water soluble vitamin found in the citrus fruits, particularly the lemon and in the Hungarian red pepper. It is a vegetable dye of the flavone group consisting of two different dyes, hesperidine and eriodictyol glucoside. Both of these compounds are probably derivatives of the same flavone glucoside, demethylated hesperidine. Hesperidine is present in large quantities and eriodictyol glucoside in small quantities in unripe fruits, the reverse being true in ripe fruit, indicating that the former is converted into the latter in the process of ripening.

Mode of Action and Clinical Application

Szent-Györgyi and co-workers placed fifty-eight guinea pigs on a scurvy diet, twenty-one received citrin (crystalline flavone fraction of lemon juice), the remainder did not.

In those not receiving vitamin P death occurred on the average in 28.5 days. Whereas those getting vitamin P lived on the average for 44 days. All eventually died of scurvy. At autopsy the findings of scurvy (fragility of bones, looseness of teeth and swelling of the joints) were present in both groups, but the incidence of hemorrhages in the vitamin P group was decidedly less. Thus it was indicated "that vitamin P has a marked and somewhat specific effect on the capillary system."

The experiments of Szent-Györgyi were repeated, at his request, by a number of other laboratories throughout Europe and in England. The results varied, some were in accord with, while others disagreed with Szent-Györgyi's results. Zilza, for instance, claimed that the effects, attributed t othe administration of vitamin P were, in reality, due to the contamination of citrin with vitamin C, and when this trace of vitamin C was removed vitamin P (so called) had no effect. Szent-Györgyi agrees with Zilza's last statement but he claims that in order to be effective vitamin P must have traces of vitamin C present. Thus whether or not vitamin P does exist is still a matter for argument and investigation.

Jersild's observations seem to support the contention that vitamin P does exist. He reports a case of Schönlein-Henoch purpura successfully treated with vitamin P. This patient was kept on a vitamin C free diet for five months, during which time the urinary cevitamic acid concentration fell to zero and manifestations of scurvy began to appear, yet the hemorrhagic tendencies of Schönlein-Henroch purpura were successfully combatted by the use of vitamin P apart from purpura in which the plalelet count is normal. Beneficial effects from vitamin P have been claimed by Szent-Györgyi in septic conditions, arthritis and endocarditis.

Summary

The existence of vitamin P has as yet not been proved definitely. Those that believe in its separate identity claim that it is a flavone dye,

found in lemons and Hungarian red pepper. It is supposed to have a somewhat specific effect on capillary permeability, but in order to act traces of vitamin C must be present. It has been used successfully in the treatment of Schönlein-Henoch purpura and good results have been claimed for it in such conditions as arthritis, endocarditis and septic states.

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The Living Neurone

(An illustration of the current method of approach to the study of Anatomy)

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THE end result of the study of Anatomy should be a mental picture of the *living* human body sufficiently complete for practical purposes. In the attainment of this end there are two main facts which the student must constantly bear in mind. First, the material available for study, be it human body or histological section, is dead. With death the cinema of life is stilled; the time element is eliminated. To quote a recent expression of Professor Cannon, a histological preparation represents "a frozen moment in the flux of life." Second, histological methods are specific in nature. A single technique reveals but one facet of a many-faceted structure. This specificity of method demands a synthesis of several mental pictures into a single composite picture of the structure as a whole.

The dynamic and synthetic approach to Anatomy is now securely established. The present paper is offered as a further example of the value of the method. The living neurone (more particularly the motor cell of the anterior horn of the spinal cord) has been selected for purposes of illustration because of the writer's special interest in the central nervous system. Almost any structure in the living body would have served the purpose equally as well.

The Motor Unit

The living motor cell in the anterior horn of the spinal cord may be visualized as a transparent, colourless, protoplasmic mass just visible to the naked eye. From the nucleus-containing portion of the cell processes extend in all directions. One process, the axon, is slender, uniform and non-branching. It may be several feet long and is specially constructed to facilitate conduction of the nerve impulse. The axon traverses the anterior root and spinal nerve to terminate in a striated muscle. Near its termination the axon branches into as many as 100 terminal branches which innervate a corresponding number of muscle fibres. A "motor unit" consists of a single anterior horn neurone and the many muscle fibres which it innervates. The remaining cell processes are dendrites. They are tapering in shape, branch freely and consist of relatively unspecialized cytoplasm. The dendrites increase the neurone surface for the reception of stimuli from other neurones and for the interchange of chemicals incidental to cellular metabolism.

Relation of Anterior Horn Cell to Surrounding Structures and Other Neurones

The nerve cell body and its processes are imbedded in a dense mesh-

work of fine nerve fibres and neuroglia cells. Capillaries, through which blood cells pass in single file, pervade the nervous tissue. Lymphatics are absent. The fine nerve fibres which make up the bulk of the intercellular mesh are, for the most part, terminal and collateral branches of axons, the cell bodies for which are situated elsewhere than in the anterior horn. Thousands of these exceedingly fine branches turn in toward the anterior horn cell body and dendrites to terminate as minute cytoplasmic swellings in contact with the surface membrane. These clear, terminal axon swellings are known as end-bulbs. End-bulbs, with the cell membrane with which they are in contact, represent the synapses which stimulate or inhibit the anterior horn cell. The individual synapses may be visualized as being in different phases of activity at any one moment. Think of a Christmas tree strung with thousands of red and green lights (red: inhibitory; green: excitatory). The individual lights blink on and off. Such is probably the case with the synapses on the motor cell of the anterior horn. The activity of the motor unit (muscle contraction or muscle relaxation) depends upon the resultant of the excitatory and inhibitory influences being brought to bear upon the motor cell by neurones with cell bodies in other parts of the central nervous system. Axon terminations may be seen when silver is deposited upon their surface. The various modifications of Cajal's reduced silver nitrate method accomplish this and yield a picture similar to that represented by the diagram of a section through a nerve cell in Fig. 1.

Neurofibrils

Within the neurones there are several structures, each of which requires a different and specialized technique in order that it may be sufficiently opaque to light to be readily visible under the microscope.

The cytoplasm is, in part, differentiated into neurofibrils. These are exceedingly fine, colourless fibrils with a refractive index similar to that of the remainder of the cytoplasm. They are, therefore, usually invisible in the living, unstained cell. Dr. Rényi, however, has observed neurofibrils in the living nerve cell and fibre of the lobster in microdissection experiments. Within the nerve cell body neurofibrils are grouped into bundles. The cytoplasmic spaces between the bundles are comparatively fibril free. In the more distal portions of the dendrites, at the base of the axon and in the axon proper neurofibrils are more closely aggregated and the larger cytoplasmic fibril free spaces are absent. The function of the neurofibrils is unknown. The older view that they were responsible for the conduction of the nerve impulse through the neurone appears incompatible with modern theories relative to the conduction of the impulse along the surface membrane of the neurone. Neurofibrils are not to be visualized in the living cell as static, rigid strands. During periods of relative cellular inactivity the fibrils are aggregated into thicker bundles but become more dispersed during phases of greater activity and especially when the cell is fatigued. Their

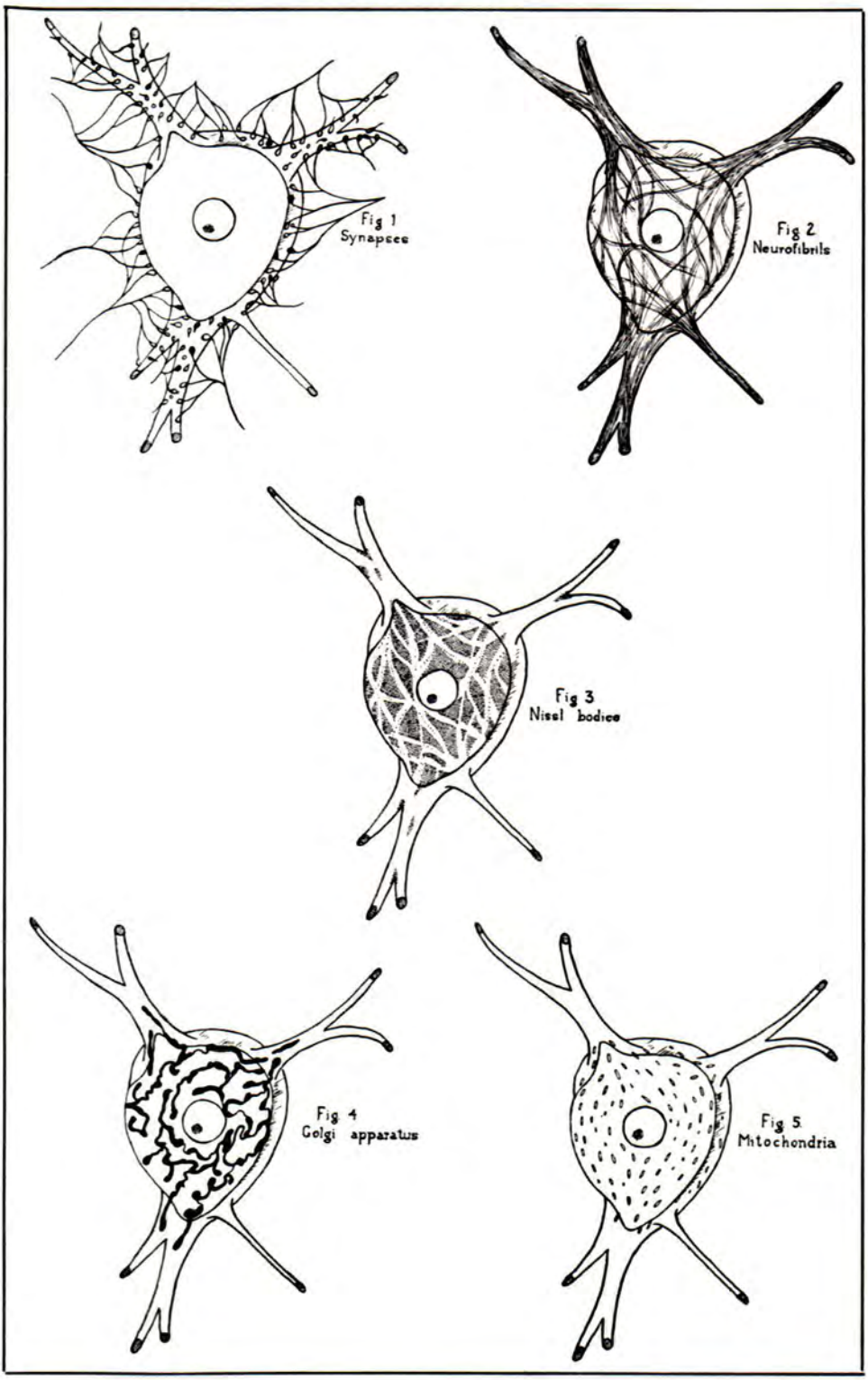
Fig 1
Synapses
Fig 2
Neurofibrils
Fig 3
Nissl bodies
Fig 4
Golgi apparatus
Fig 5
Mitochondria

dispersion is also characteristic of neurone injury as in the retrograde reaction following section of the axon. The dispersion of neurofibrils during cellular activity and injury is probably due to the increase in water content of the cell which characterizes these states. The ultimate significance of these changes is unknown.

In vertebrate neurone a metallic deposit must be laid down upon the surface of the neurofibrils before they can be seen. Silver is usually used as in certain modifications of the Cajal reduced silver nitrate technique and the Bielschowsky method. Their stained appearance is represented in diagramatic form in Fig. 2.

Chromatin

The comparatively fibril free cytoplasmic spaces contain chromatin material, so-called because of its colouration by basic stains. Chromatin consists, in part at least, of nucleo-proteins. The nucleic acid radical is responsible for the acid properties of chromatin. The protein radical is specific for various species and for various types of cells. Chromatin contains iron and probably other elements and substances of which we know little. In the living neurone chromatin is present in colloidal form and is practically invisible unless stained since it has the same optical qualities as the remainder of the cytoplasm. When the cell is dead and fixed, chromatin precipitates into granules which occupy the fibril free spaces and form the familiar Nissl or nigroid bodies of the stained preparation. Chromatin is especially abundant in the large motor cells of the anterior horn. Its function in the cell is not known but it probably represents a source of energy for the neurone. The colloidal chromatin is continually active chemically in the living neurone. During phases of comparative quiet anabolic reactions build up material for future use. During cellular activity the chromatin is catabolized. The water content of the cell increases at the same time, thus dispersing the chromatin. After prolonged cellular activity and when the neurone has been damaged the chromatin decreases in amount and the Nissl bodies of fixed and stained preparations gradually disappear. This so-called chromatolysis following axon section has been invaluable as a histological technique in establishing the nuclear origin of fibre tracts. The chromatin material in the form of Nissl bodies is illustrated in diagramatic form in Fig. 3.

Golgi Apparatus

Nerve cells, like most plant and animal cells, contain a highly interesting but poorly understood structure, the Golgi apparatus. Discovered by Golgi in 1896, an immense amount of work has been done without final elucidation of its structure or function.

In the anterior horn cells of the spinal cord the Golgi apparatus is in the form of a net-work of anastomosing strands in the cytoplasm on all sides of the nucleus. The material of which the net is composed is fluid or nearly so in consistency and of about the same optical value and

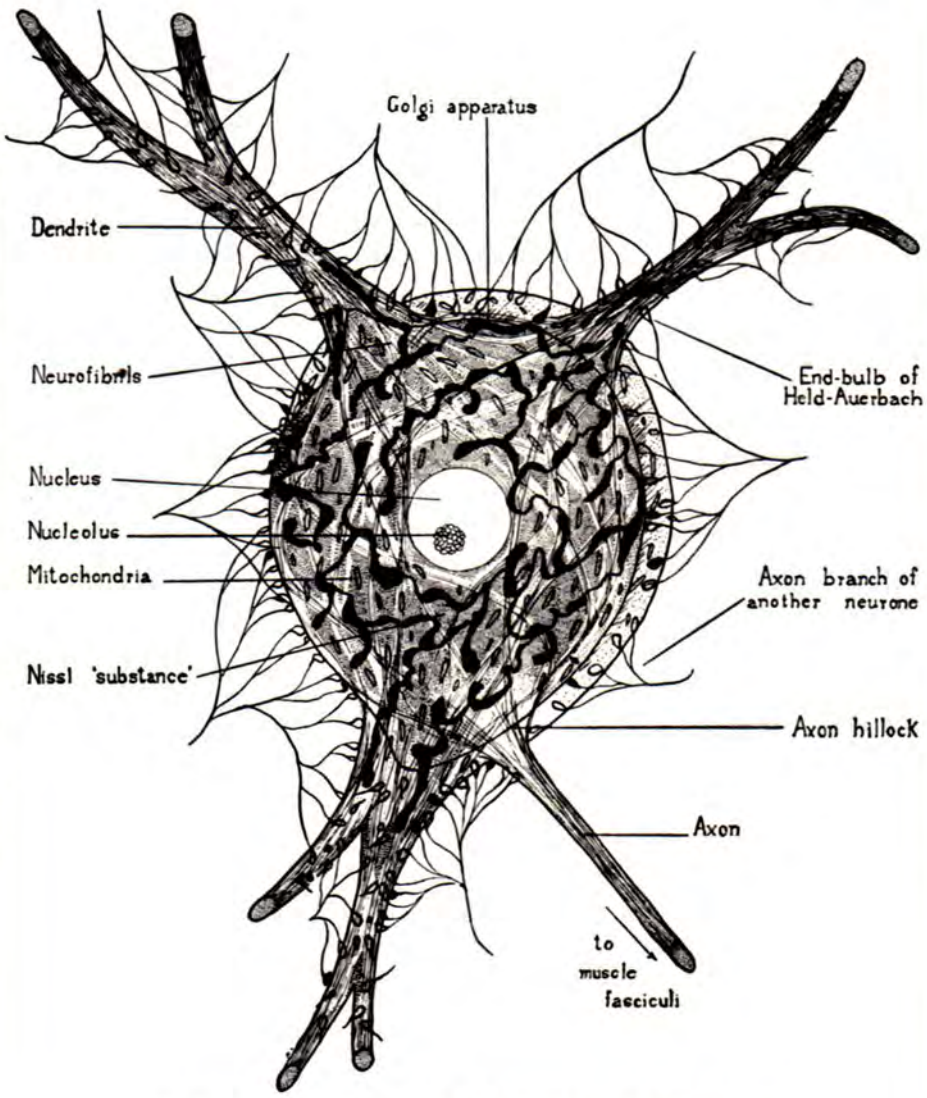

Fig. 6. A nerve cell body and proximal portions of its processes as synthesized from several staining techniques.

specific gravity as the surrounding cytoplasm. Consequently the Golgi apparatus is invisible in the living, unstained cell. In silver or osmic acid preparations the apparatus has the appearance of stiff black strands. In life, however, the apparatus is to be visualized as a highly plastic structure probably changing in shape and position from moment to moment with variations in activity of the cell. The fluid consistency of the Golgi apparatus is testified by the fact that it offers no resistance to the dissecting needle in micro-dissection experiments.

The chemical composition of the Golgi apparatus is unknown. Because of its affinity for osmic acid and solubility in alcohol it is thought to contain lipoid substances. Proteins of unknown nature are probably present as well. The chemistry, even more than the form, of the Golgi apparatus changes during the constantly changing phases of cellular activity.

The function of the Golgi apparatus is quite unknown. Its activities are probably of a fundamental nature in cell metabolism because of the almost constant occurrence of the apparatus throughout all tissues of the entire animal and plant series. In addition to a basic function common to all cells the apparatus is probably specialized to a greater or less degree in certain highly specialized types of cells. In secreting cells, for example, there is some evidence to suggest that the apparatus assists in the elaboration of the secretion.

Injury to the nerve cell, if sufficiently severe, results in the dispersion and finally dissolution of the Golgi apparatus. Penfield has shown such a sequence of changes to be characteristic of the retrograde reaction resulting from section of axons.

The fixed and stained Golgi apparatus is represented in Fig. 4.

Mitochrondria

The mitochrondia share with the Golgi apparatus an obscurity of composition and function. In motor nerve cells the mitochrondria are short filaments. There is no doubt about their presence in life since the mitochrondria may be seen in living, unstained cells.

Mitochrondria are stained specifically with Janus Green B and are very soluble in lipoid solvents. The idea is prevalent that mitochrondria are of a phospho-lipin nature with perhaps a small amount of protein in combination. Their chemistry, however, is probably much more complex and may vary as in the case of the Golgi apparatus during various phases of cellular activity.

Almost every cellular function has been assigned to mitochrondria at various times. Altmann, who first drew our attention to these structures, believed them to be micro-organisms of a bacterial nature with a symbiotic relationship to the living cell. Like the Golgi apparatus, mitochrondria are a universal constituent of plant and animal cells. Consequently it may be assumed that they function in one or more of the basic activities of cellular metabolism. It has been suggested more

recently that mitochrondria may take part in cellular respiration, a still unproven but useful working hypothesis.

Mitochrondria undoubtedly continually undergo changes of a chemical nature with the various phases of neuronal activity. Those of nerve cells, however, are rather resistant to morphological change. Cellular damage of a minor degree leaves the mitochrondria unaltered, although they may fragment and disappear during more severe injury such as axon section.

Mitochrondria, as stained with Janus Green B, are represented in Fig. 5.

Synthesis

The one-sided picture resulting from the application of various cytological techniques must now be synthesized into a picture of the more or less complete nerve cell. This has been done diagramatically in Fig. 6. All figures represent thick sections through the nerve cell. The remainder of the cell is in adjacent sections.

This article is intended to be illustrative of a method rather than factually informative. Source references, therefore, have been avoided. Leads to the literature may be obtained from the various texts written or edited by Professor E. V. Cowdry, an outstanding exponent of the dynamic approach to the study of Anatomy.

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The author wishes to thank Mrs. Margaret Corrin for her care in preparing the illustrations.

Subclinical Scurvy

By E. L. BROWN '40 *and* J. D. GALLOWAY '40

SCURVY, as is now well known, is due to a lack of vitamin C in the diet. The disease has been known for hundreds of years. Hippocrates referred to it, but the best early description is that of de Joinville who accompanied the Crusaders in their invasion of Egypt in the 13th century. From this time, accounts of the occurrence of scurvy are numerous, especially in connection with wars and sea voyages where fresh food deprivation was common. The first big advance was made by Lind in 1752 when he recognized that scurvy could be prevented and cured by the citrus fruits and certain fresh vegetables. However, it was not until near the end of the 19th century that it was realized that an accessory food factor was responsible for this effect. Until this time various theories had been held as to the etiology of scurvy, such as potassium deficiency, citric acid deficiency, acidosis, toxic and bacterial factors. Only after the discovery that Beriberi, Pellagra, etc., were deficiency diseases, was the true nature of scurvy realized. The various accessory food factors were separated during the first 25 years of the present century, and of these the anti-scorbutic factor was designated as "water-soluble C" or simply "vitamin C." Vitamin C potency of various foods was determined by methods of biological assay. The climax came in 1928 when Szent-Györgyi isolated vitamin C in a pure crystalline form from oranges, lemons, cabbage and suprarenal cortex. This crystalline product was proved to be closely allied to hexuronic acid and has been appropriately named "ascorbic acid." Later Hirst *et al* synthesized ascorbic acid and determined its structural formula. King and Waugh proved that crystalline ascorbic acid was capable of preventing scurvy in a guinea pig on a scorbutic diet.

After the structure of the vitamin had been established, it was an easy step to devise chemical methods of determining the presence or the vitamin, both qualitatively and quantitatively. With the refinement of these methods it has become possible to investigate the vitamin content of the body tissues and its metabolism as it has in the case of no other vitamin. These investigations have resulted in the postulation of the existence of a subclinical or "latent" scurvy. A tremendous volume of recent work suggests that such a condition does exist, that it is far more frequent than is generally conceived, and that it plays an important role in many diseases. It is in connection with the manifestations of and the various methods of investigating this condition that the authors propose to deal.

The existence of a prescorbutic state or latent scurvy was first postulated by Hess in 1917. Other observers attempted to prove the existence of such a state by various tests. Zilva in 1936 denied its

existence, but the latest work, done in the last two years, has confirmed the existence of such a state and shown that it is very common.

An examination of the literature reveals the following methods of investigating sub-clinical scurvy. These may be classified as follows:

(1) Capillary Resistance Test.
(2) Chemical Analysis,
    (a) Blood
    (b) Urine
    (c) Spinal Fluid.
(3) Methods of Determining Vitamin C Saturation,
    (a) Six-Hour Excretion following Test Dose
    (b) Blood Absorption Curve.
(4) Intradermal Dye Test.

(1) *Capillary Resistance Test.*

This simple procedure was devised by Göthlin in 1930. There have been many modifications of the original procedure. One of the simplest methods and one which may be used at the bedside has been devised by Wright and Lilienfeld. A circle one inch in diameter is drawn on the inner aspect of the forearm. A pressure midway between the systolic and diastolic pressures of the patient is then applied by means of a sphygmomanometer, the rubber cuff being applied to the upper arm in the usual manner. The pressure is maintained for fifteen minutes and five minutes after it is released the number of macroscopic petechiae within the circle are counted. Ten or less petechiae within the circle is normal, ten to twenty petechiae border-line, and counts above twenty pathological.

Another method of estimating capillary resistance or fragility is that of Hecht. It consists essentially of exerting a negative pressure on the capillaries by means of a suction cup placed on the skin surface and determining the least negative pressure necessary to produce macroscopic petechiae. Thirty centimeters of Hg. negative pressure is considered the lower limit of normal.

The question now arises as to the relationship between increased capillary fragility and the state of vitamin deficiency. In other words, can the capillary resistance test be used to detect such a state of latent scurvy. Obviously this test was based on the well-known fact that hemorrhagic manifestations are common in frank scurvy. These hemorrhagic tendencies are the result of defective intercellular substance of the capillary wall. Chemical tests, devised at a later date, have confirmed the experimental findings that this test is a good but rough estimate of the state of saturation of the body with vitamin C. It is claimed that increased capillary fragility is not specifically the result of vitamin C deficiency but may occur in a variety of other conditions as thrombocytopoenic purpura, scarlet fever, diphtheria, and anemia.

Since increased fragility may be due to conditions other than vitamin C deficiency, it should be considered due to such a deficiency only when the blood value is subnormal and when a favourable response follows a therapeutic test.

Some workers, notably Sloan, consider this test an excellent one in the diagnosis of latent scurvy. On the other hand, Wright and others claim that it is valueless for it gives positive findings only when the blood value is 0.14 mgms. per cent or less. That is, mild deficiencies with which we are dealing are not detectable by this test. Again Liebmann, Wortis and Wortis have reported positive findings in a large percentage of normal patients. In view of these conflicting reports, the value of the test is open to question.

(2) *Chemical Analyses.*

The chemical are more accurate than other methods. The determination of vitamin C by chemical analysis depends on the reducing property of the vitamin. The vitamin, in solution, is titrated against a standardized solution of 2:6 dichlorophenolindophenol. This coloured indicator solution is quantitatively reduced by the vitamin to a colourless compound.

(a) *Blood.*

The method of Farmer and Abt, or some modification of this method, seems to be most popular. The plasma from oxalated blood is deproteinized with metaphosphoric acid. The centrifugated plasma is titrated with a standardized solution of 2:6 dichlorophenolindophenol. For a detailed method of conducting this test the reader is referred to the work of Farmer and Abt.

Ingalls gives the following values:

		Plasma Ascorbic Acid (Mg. %)
Optimum	Saturation	2.00 — 1.00
	Normal	1.00 — 0.70
	Low Normal	0.70 — 0.50
Suboptimum		0.50 — 0.30
Deficiency	Asymptomatic Scurvy	0.30 — 0.15
	Scurvy	0.15 — 0.00

0.70 mgms. is the value accepted by the majority of authorities as the lowest normal value.

(b) *Urine.*

The estimation of vitamin C in the urine is a measure of that amount excreted by the body. Since it is dependent on the body content of vitamin C and influenced by ingestion of the vitamin, a single urine analysis is in itself valueless. However, urinalyses are very useful in saturation tests considered below.

(c) *Spinal Fluid.*

The principle of estimating vitamin C in spinal fluid is the same as that of estimating it in blood plasma, except that, unlike blood, spinal fluid contains other reducing substances such as cysteine, glutathione and other compounds containing sulph-hydryl groups which may interfere. The elimination of these interfering substances can be effected by precipitation with mercuric acetate. However, since they act much slower than does ascorbic acid, a prompt reading will obviate the necessity of eliminating them.

The values for vitamin C in the cerebro-spinal fluid are similar to those found for blood plasma. Wortis *et al* state that the value for blood plasma and spinal fluid correspond only in the ranges above 0.70 and below 0.40 mgm. per cent. In the range from 0.40 to 0.69 they found no such correlation and in these cases, which after all are the more difficult to diagnose, every available test should be employed.

(3) *Determination of Vitamin C Saturation.*

(a) *Six Hour Excretion following Test Dose.*

The method given is that of Sloan and is the determination of the six hour excretion following a test dose. It is a modification of the method of Harris and Ray. A measured amount of synthetic vitamin C dissolved in distilled water is administered, preferably intravenously. The amount of the vitamin excreted in the urine during the following six hours is determined. The result is expressed as the six hour intake-output ratio (six hour - 1 in 6). A ratio below 2.5 is considered indicative of normal saturation.

This result may also be expressed in percentage, in which case an average value of 44 per cent of the test dose is excreted within six hours by normal persons, only 27 per cent by mildly deficient ones, and 16 per cent by severe cases.

According to Sloan, the results with this procedure at the present time show that this is the most precise measure of saturation available. The difficulties of such saturation test, however, preclude its use in routine work.

(b) *Blood Absorption Curves.*

As Wright so admiraly states, the assay of a single sample of blood is comparable to a single blood sugar. It gives an idea of the status of the body at the given moment, but may have been affected considerably by intake or deficiency of vitamin C during the preceding 24 to 48 hours, or by other factors as renal retention. Therefore, it would seem more accurate to use a test similar to a glucose tolerance test, which is done. In this test, parallel blood and urinary studies eliminate the error possible from renal retention. A fasting sample of blood is obtained, the vitamin is administered by the intravenous

route following which further blood specimens are taken at five minutes, one, two and four hours. The last specimen is required to note changes in the blood of the mild deficiencies, where a deviation from normal takes place only at this time. An excretion curve is obtained as for the six hours excretion test above.

(4) *Intradermal Dye Test.*

This test was first suggested by Rotter of Budapest. He postulated that since the estimation of vitamin C is dependent on the reduction of the blue dye — 2:6 dichlorophenolindophenol to its leuko form by the vitamin, this reduction might be studied directly in the tissues. 0.01 c.c. of fresh sterile dye made by dissolving 2 mgms. of dye in 4.9 c.c. of water is injected into the skin of the forearm. Portnoy and Wilkinson confirmed Rotter's findings that the time required for decolorization paralleled the degree of vitamin C saturation. On the other hand, however, Poncher and Stubenrauch and independently Wright deny such a correlation. Further study is necessary to determine whether the test can be of value in assessing the vitamin C saturation of the body. At best it is but a rough estimation.

Discussion.

Like all laboratory procedures, the tests for determining conditions of hypovitaminosis are in themselves only relative and should never supplant but rather support the clinical findings. Thus the physician, suspecting a condition of vitamin C hypovitaminosis from the history and physical examination may confirm his diagnosis by the abnormal results of the tests as listed below.

Test	*Results found in Sub-Clinical Scurvy*	*Value of Test*
Capillary fragility	15 or more petechiae	Doubtful
Single blood assay	0.70 mgms. per cent or less	Limited
Urine assay	Variables	Valuable only when combined with other tests
Six Hour Excretion following Test Dose	6 hr. - 1 in 6 = 2.50 or more	Reliable if no renal insufficiency
Blood Absorption + Urinary excretion	Abnormal curve	Reliable and will reveal false results due to renal retention
Intradermal Dye Test	10 min. or more for oxidation of dye	

A perusal of the above table reveals that many of these tests are of doubtful or limited value. However, by the use of the more reliable tests (Six hour excretion following test dose, Blood absorption plus urinary excretion), it has been positively shown that the condition of preclinical scurvy does exist. Moreover, it is very common and among all economic classes. Thus Wright in his series of cases includes five cases in doctors or their families, eight cases in nurses and one case in a man who owned a large orange grove. It would be a safe generaliza-

tion to make that practically every physician occasionally has had one or more of these cases pass through his office or clinic unrecognized.

The question now arises as to what effect this hypovitaminosis has upon the functioning of the body. Many of these cases are asymptomatic and have been discovered accidentally during investigation. On the other hand, a large number present symptoms which vary enormously, including weakness, heaviness, pains in the legs and elsewhere, dizziness, nausea, dyspnoea, bleeding from nose, mouth, rectum and bladder, easy bruising, and many others. The signs consist of bleeding of the gums, throat, nose, urinary and gastro-intestinal tracts, purpuric spots and evidence of rupture of the surface blood vessels, brawny pigmented edema of the lower legs, and any others depending on rupture of blood vessels. It is quite possible that many patients who complain of vague, indefinite symptoms are suffering from a lack of vitamin C. With such patients investigation is warranted, or if this is not feasible, a therapeutic trial may be done. Due to the fact that sub-clinical scurvy is so prevalent, it is only natural that it should be associated with many diseases. The following are only a few of those conditions in which at one time or other a hypovitaminosis has been considered: Pneumonia, tuberculosis, rheumatic fever and rheumatoid arthritis, whooping-cough, osteomyelitis, diphtheria, poliomyelitis, peptic ulcer, thrombocytopoenic purpura, wound-healing, hemorrhagic diseases and other conditions. Naturally the question arises as to the relationship between these conditions and the hypovitaminosis. Is the vitamin lack merely casual or does it play a definite role in the etiology and course of the disease? Reports have claimed a therapeutic action for ascorbic acid in every condition from congestive heart failure to diabetes mellitis (Cuttle). It is not possible in an article of this length to discuss all these diseases in detail. However, there follows an account of those diseases in which the vitamin lack plays, if not an etiological, at least more than a casual role.

Relation of Vitamin C to Infection.

Experimental work has indicated that there is a relationship between vitamin C deficiency and infection. Experiments have shown that vitamin C can inactivate diphtheria toxin in vitro and in vivo. Vitamin C can decrease the virulence and inhibit the growth of diphtheria bacilli in vitro, and can protect animal tissues against the ravages of the toxin. An important practical point is that such protection requires much larger amounts of vitamin C than is necessary for the prevention of scurvy. It has also been demonstrated that the virus of poliomyelitis can be inactivated in vitro vitamin C. It has been shown that administration of vitamin C promotes the formation of antibodies.

Clinically, the therapeutic use of vitamin C in infections has produced variable results. Encouraging results have been reported in

pneumonia, diphtheria and in the promotion of wound healing. It has been impossible to demonstrate any degree of protection against other acute infections such as tonsillitis, otitis media and abscesses. In spite of these results, it has often been observed that most patients suffering from infections have vitamin C levels far below normal, often indeed attaining levels seen in frank scurvy. Some investigators have even postulated the idea that the extent of the hypovitaminosis parallels the severity and course of the disease. Consequently these individuals require much larger doses of vitamin in order to maintain proper saturation.

In seeking an explanation for the increased requirements in infection, an association with the accompanying leucocytosis has been suggested. This is based on the known fact that the leucocytes contain a relatively large amount of ascorbic acid. In infectious cases the presence of an abnormally large number of leucocytes should therefore require an increase in the amount of vitamin C.

Whooping-Cough.

In most cases of whooping-cough there is a condition of C hypovitaminosis. However, the effects of administering ascorbic acid in the treatment of this disease have not yielded uniform results. Ormerod *et al* in two reports conclude that saturation of patients with ascorbic acid decreases markedly the intensity, number and duration of the characteristic symptoms. Indeed, they believe vitamin C to be almost specific in the treatment of whooping-cough. On the other hand, Gairdner in a recent series of four cases, of which one-half received vitamin C, states that he cannot confirm these results. He concludes that the value of vitamin C in whooping-cough is as yet unproven. It is obvious that further work is necessary to determine if vitamin C has any specific effect on the course of the disease. Nevertheless, since a deficiency does exist in the majority of cases, it is undoubtedly wise therapy to administer the vitamin.

Rheumatic Fever

Rinehart showed experimentally that lesions similar to those of rheumatic fever in humans could be produced by the combined influence of infection and vitamin C deficiency. It will be noted, however, that in no way is the influence of infection minimized. The main pathological features in both rheumatic fever and scurvy are in the connective tissue elements. Rinehart's concept would explain the hemorrhagic features of rheumatic fever and its epidemiological peculiarities. Thus rheumatic fever, like scurvy, is common in the winter months and in the poorer classes where you are likely to find deficient diets.

Abbasy, Hill and Harris showed that patients with active rheumatic fever excrete less vitamin C in the urine than do normal people with the same intake of the vitamin. Patients convalescing from the disease

excrete an amount mid-way between that excreted by the above two groups.

Race found that patients with rheumatic fever showed deficiency in vitamin C as measured by blood assays. This has been confirmed by Rinehart *et al.* Keith and Hickmans in a study of the vitamin C excretion in the urine of children with rheumatic fever could find no evidence to support the theory that this disease was a manifestation of a vitamin C deficiency associated with infection.

Vitamin C deficiency does occur in rheumatic fever and no doubt some of the manifestations of this disease are due to this deficiency. However, whether the deficiency is a cause or an effect of the disease is yet to be proven.

Rheumatoid Arthritis.

In cases of rheumatoid arthritis there is a low value for vitamin C in the blood plasma and a decreased urinary excretion. This deficiency may be an important etiological factor in this condition. This view is supported by the encouraging therapeutic results obtained by administering the vitamin in this disease. Rinehart *et al* have suggested that the vitamin C deficiency predisposes to bacterial localization. As in the case of rheumatic fever, the role of vitamin C deficiency as an etiologic factor in rheumatoid arthritis requires further investigation.

Peptic Ulcer.

Many investigators have confirmed the fact that a prescorbutic state occurs in the vast majority of persons afflicted with peptic ulcer. This, no doubt, arises as a result of the diet regime of such patients. Since it is equally well known that a state of vitamin C deficiency is a potent cause of delay in wound-healing, it becomes apparent that vitamin C should be included in the diet.

Experimental studies have indicated that a vitamin C deficiency might play a role in the etiology of peptic ulcer. However, this has not been confirmed and the most we can at present say is that the deficiency (present coincidentally or induced in the therapeutic diet) promotes chronicity and induces hemorrhage. Therapists are stressing more and more the importance of saturating their patients with vitamin C.

It must be emphasized that the status of vitamin C is far from settled. The role of the vitamin in the etiology of disease requires much more investigation. It has been proven that subclinical scurvy does exist both in the so-called normal persons and in those suffering from definite diseases. It is quite probable that in these latter the symptom complex is much augmented by the hypovitaminosis.

SUMMARY

1. The methods of investigating the vitamin C content of the body, fluids and tissues have been discussed.

2. The results of these tests have enabled various investigators to

establish normal standards of vitamin C saturation. These values are given.

3. It has been established by many workers in recent years that many people suffer more or less silently from a vitamin C deficiency which has been termed "subclinical scurvy" or the "prescorbutic state."

4. In view of the great prevalence of this condition it is to be expected, indeed proven, to exist not only in so-called normal individuals but also in those suffering from various diseases.

5. Numerous diseases in which vitamin C lack has been incriminated as a casual factor have been listed. Only those in which the relationship seems to be more or less definite have been discussed.

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The Neuroses

By MORTON GOLDEN, B.S., Meds. '40

They avoid it here,
They shun it there,
Tho' physicians meet it everywhere.
Is it body,
Or is it mind?
That neurotic case they left behind.

* * *

IT is a common fact that many neurotic patients are wandering in vain from doctor to doctor in their quest for health. Psychological factors play a large part in medical practice, but little attention is paid to them in the medical curriculum. The question "Physical or psychic?" is in most cases wrongly put. Bleuler is of the opinion that it should be replaced by the question "To what extent physical and to what extent psychic?"

DISCUSSION

Noyes defines the neuroses as a group of relatively benign mental disorders; the symptoms of which, usually expressed subjectively with occasional objective physical manifestations, are due either entirely or in part to mental forces. The terms neurosis and psychoneurosis are now used interchangeably. However, the expression, neurosis, is a misnomer, since there is no disorder of the nerves. There has also been a tendency to label neurotic disturbances as functional disturbances. Henry believes that the word functional ought to be entirely disregarded in the discussion of the neuroses. All general physical and special neural activity is functional in the sense that every tissue or organ has a normal function. To convey the notion of initiation of a function which is not the implied result of some organic activity, one should attribute the cause to psychogenic reasons.

Too often the disease and not the patient is under observation. We may find organic changes in the neurotic person, but we usually find them greatly dependent upon the special psychic attitude. Adolph Meyer, called the father of psychobiology, claims that the physician should pay more attention to the activity and behaviour of the individual (the total organism) as opposed to the activity of a single and detachable organ. White refers to the soma (body) and psyche (mind) as simply different aspects of the same biological unity—the individual. It is said that tears are not the consequence of sorrow, nor is sorrow the consequence of tears. One complex occurrence manifests itself psychically by sorrow and physically by tears.

The problem of neurosis is closely related with the glandular and nervous systems of the body. It is known that atropine alters the heart beat, the gastro-intestinal motility, and pupillary size; and with these

changes produces subjective reactions of an unpleasant type. Fear and anger produce likewise changes in the visceral functions. If we consider the neuroses to be due to a change in the individual's whole attitude towards life, we can see that glandular and autonomic nervous system changes will follow. Noel Burke says, "Just as worry and fright will produce white hair and a wrinkled face which are physical changes, so may a distorted mind through emotional disturbances produce bodily disorder which may become a matter of importance by itself." Neurotic manifestations are merely the visible signs and symptoms of an underlying order; just as jaundice is a sign of hepatic malfunction. Crookshank calls it odd that doctors, who, when students, suffered from frequency of micturition before an oral exam, or who when in France near the battlefront had experiences of bowel looseness, should refuse to seek a psychical correlative not to say an etiological factor for a case of enuresis or mucous colitis.

Wechsler believes that for an understanding of the neuroses it is more important to know why a person does a certain thing than how he does it. The former can best be interpreted in psychological terms; the latter belongs to the field of neuroanatomy and neurophysiology. At present, we have no primary morbid anatomy or physiology of a neurosis. The gap to be bridged is the hope that some day we shall be able to explain psychological phenomena in terms of physiology or vice versa.

ETIOLOGY

The most obscure chapter in the whole field of neuroses is their etiology. All theories, whether organic or psychological, assume some sort of constitutional predisposition and some hereditary factors as the fertile subsoil in which neuroses may take root. Modern dynamic psychology, in addition, puts great emphasis on developmental and environmental factors. Shakespeare's statement as to the genesis of greatness has been paraphrased to say that some individuals are born neurotic, others achieve neurosis, and still others have neurosis thrust upon them.

There are a number of psychologic concepts without which it is impossible to give any modern formulation of the psychoneuroses. Psychologists view the mind as a complex receiving and transmitting set having two levels, the unconscious and the conscious. The unconscious mind contains the inaccessible components which are outside personal awareness such as the primitive inborn instincts and the repressed distasteful memories. Jones writes, "So intimate are we with our thoughts and emotions that it is exceedingly difficult for us to believe that all this self knowledge is only very partial, and that the most important part of our conscious mind is merely what has been allowed to filter through the unconscious." Hypnosis has demonstrated the presence of a choice of action in our dynamic unconsciousness. Subjects, when hypnotized, will fail to carry out repugnant commands.

The libido, the primitive energetic drive of the unconscious, is

continually seeking satisfaction. Freud claims the libido to be solely concerned with sensual desires, and that neuroses arise out of unresolved conflicts resulting from a frustrated libido. Society is continually adding restrictions and checking the discharge of libido. The dissociation of the energy of the pent up libido and its attachment to bodily organs so that it may give rise to signs and symptoms is known as conversion. It is a method to discharge the dammed up libido. Physically, these discharges find their expression mostly in attacks—pylorospasm, gall bladder spasm, migraine, asthma, intestinal colic, etc. Deutsch believes that conversion finds in diseased organs its most favorable sphere, and where such are lacking there is often an attempt to produce illness. Pathological anatomical alterations already present, but clinically latent, are so changed through psychic processes as to become manifest as organic diseases.

Reich has the view that a direct change of libido into symptoms of anxiety is improbable. He thinks that the frustrated libido with its pent up instincts, glandular secretions, and metabolic processes which normally are katabolized, have a toxic effect on the autonomic nervous system. This sets up a constant excitation which shows itself as the symptoms of a neurosis.

Adler believes that the libido is mainly seeking power and self-esteem, and considers a neurosis to be due to the incapacity for attaining one's goal while being a member of society. He claims that the neuroses are unconscious alibis for skipping the demands of reality and serve as a protection when ambitions are balked. He upholds a neurosis as a miserable victory over a society whose demands have been too much.

Meyer places chief stress on the conscious life experiences of the individual. Myerson assumes the fact that every man has trouble, conflict, and emotional disturbances of some sort. He says, "So long as a person's energy, bodily functions, and his ability to respond to the situation are not impaired he has only a simple disappointment. But when the unrest reaches into his physiology so that he can no longer sleep or eat with heartiness, and when his consciousness of his body becomes agog with fear, and when he centers his attention to the reaction within himself, then he has a neurosis." The neurosis tends to appear at that point when the troubled individual becomes a sick person with subjective or objective symptoms.

In general, the neurotic manifestations are the only visible symptoms of an excessive inner tension proceeding from an unresolved conflict. In this conflict, the important elements are sexuality, aggression, self-esteem, fear and love. Thwarted and repressed impulses provide the active dynamic urge that starts everything going. In times of great social stress, for example, war, epidemics and economic depressions, the demands made upon the individual to submerge himself not

infrequently brings forth a crop of neurosis. The function of a neurosis is to keep at bay the anxiety and distress accompanying the repressed impulses, and to serve as a substitute gratification. Altogether, the neurotic reaction, in the process of social adaptation, represents a childish attitude, an inability to cope realistically with life in an adult manner. The symptoms may vary from a slight headache, and increased fatigability, to devastating visceral disturbances.

DIAGNOSIS

The diagnosis of a neurosis involves the differentation from organic disease, border line psychosis, and malingering. For the general practitioner, the distinction between organic disease and neurosis is the most important. The diagnosis of a neurosis should not be made merely because nothing physically has been discovered after a thorough physical examination. Physical disease may be present long before it can be detected. Then again, there may be irrelevant physical abnormalities which may not be the cause of the symptoms.

Neurosis is an ailment which does not depend merely on negative findings. It has positive symptoms of its own. Ross says that no diagnosis should be made unless the following symptoms are present:

1. Peculiar and often contradictory nature of symptoms. Neurotic patients usually have confusing stories to relate. All sorts of odd things give them symptoms.

2. Presence of nervous manifestations such as anxiety, panic, phobia, or apprehension.

3. Attitude of patient towards his symptoms. Generally, the patient with organic disease is not very interested in it. The neurotic talks of his ailment, persistently. He is ever seeking a fresh diagnosis, provided it is not too serious.

4. Whole life history will usually reveal that past illnesses arose in times of stress.

The neurotic is generally sensitive, introspective, emotionally unstable, craves attention and is pre-occupied with himself, and his bodily functions. Despite the unconscious determination of his symptoms, he has fairly good insight into his condition, realizes that he is sick, and wants to get well. His symptoms are genuine and may be more incapacitating than those of organic disease.

The psychotic, on the other hand, has no insight into his condition, does not realize that he is sick and has broken away from reality. He is markedly or completely anti-social, and lives in his own world.

A malingerer is feigning and consciously tends to reproduce signs and symptoms of a disease. There usually is a motive and an intention to deceive. The malingerer generally overacts. Example of this is the

patient who was blindfolded and tested for skin sensitivity. He calmly said, "No, I don't feel it," only on those occasions that he was touched.

CONCLUSION

We lack perspective concerning our knowledge and are confused in our concepts of the inter-relationships between psychic and somatic processes, in health and disease. Deutsch finds that "the seemingly irrelevant neurotic behaviour is full of meaning and an inherent part of the existing psychic situation." The patient is speaking a double language. The physician should listen to both.

Back in the sixteenth century it was Paracelsus who said, "Only he who grasps the innermost nature of man can cure him in earnest."

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Abstracts

THE CONSERVATIVE TREATMENT OF GALL BLADDER DISEASE

By MOCK, BROWN and DOLKART

Surg., Gyn. & Obstet., 66:79, 1938

The authors conclude that the present conceptions of the medical management of gall bladder disease, using low fat, low cholesterol diets in conjunction with saline purgatives, have no sound physiological basis.

On the result of their study of 120 patients with chronic gall bladder disease they found that the use of hourly feedings of milk and cream to induce contraction and emptying of the gall bladder, Keto cholanic acids to stimulate the flow of hepatic bile, and antispasmodic medication to diminish the irritability of the gastro-intestinal tract, effectively relieve symptoms and reduce the incidence of colic in the majority of cases.

The authors indicate operation for the following conditions:

1. Cholethithiasis giving definite gallstone colic. Wait for attack to subside before operating.

2. Empyema of the gall bladder.

3. Obstructed cystic duct with a markedly dilated gall bladder. Infection may easily develop in such a gall bladder.

4. Obstructive Jaundice: Do not operate until jaundice is lessening or has subsided.

5. Subacute or chronic pancreatitis, usually accompanying a cholecystitis.

6. Cholecystitis: When no improvement occurs after careful persistent medical management, surgery is justified.

7. Gangrenous Gall Bladder: The threat of this condition developing is a strong argument in favor of surgery in the presence of recurring attacks of gall bladder disease unrelieved by medical management.

—C. DELITSKY, '40.

UNDULANT FEVER: DIAGNOSIS AND MODERN METHODS OF TREATMENT

By H. P. FLIPPIN; 149:159, 1939

Undulant fever is a disease which is as varied as syphilis in its course and can attack any organ in the body.

The syndrome most commonly seen is weakness, a continuous fever which has an undulating course, sweating which is more severe than in any other condition, loss of weight, joint pains and headache. A history of handling cattle, hogs or goats, or drinking raw milk may frequently be elicited, but regardless of the history the diagnosis must be confirmed in the laboratory.

A positive blood culture is of value but is not practical. The blood agglutination test is used very widely, but in the author's opinion is positive in only a small percentage of cases. He finds the intracutaneous reaction the most sensitive test for detecting brucellosis, but in order to differentiate an active infection and immunity he determines the apsonocytaphagic power of the blood for brucella abortus.

In addition to the usual symptomatic treatment, the use of a specific polyvalent anti-melitensis serum given along with sulphanilamide is recommended as the treatment of choice. Typhoid vaccine has also proven to be of value in chronic cases.

—J. LEVINE, '40.

JUVENILE RHEUMATISM

By B. SCHLESINGER

The Practitioner; cxlii, 375, 1939

The author presents a brief but concise account of some obscure and debatable points concerning Juvenile Rheumatism with a review of the modern conception of the disease and its treatment. The confusing state of present-day knowledge of the etiology of Rheumatic Fever

is pointed out. Under symptomatology some popular fallacies about "growing pains" and fever as diagnostic symptoms are indicated. The rôle of the sedimentation test in diagnosis and prognosis is discussed. That sodium salicylate still remains the drug of choice in treatment is indicated, but the rôle of the newer preparations is also given. The value of convalescence is stressed and the place of tonsillectomy in porphylaxis and active treatment outlined.

—J. GALLOWAY, '40.

LUNG ABSCESS

By W. P. WARNER, M.D.

C.M.A.J., 38:544, 1938

This is a review of 98 cases of lung abscess studied in the Toronto General Hospital over the course of ten years.

With respect to etiology, the largest group were due to inhalation of material following operations on the upper respiratory tract. There was also a large group of idiopathic abscesses, i.e., without any obvious cause. Nineteen per cent were due to pneumonia. Other causes were infarction and carcinoma.

Lung abscess was shown in this sense to have a greater incidence and a greater mortality among males than females. The mortality in males was 57 per cent; in females 19 per cent. The greatest age incidence was in the fifth decade.

The author then outlines the symptoms in detail. He points out especially the great variability which may exist in the symptoms. With respect to physical signs, the author emphasizes that these are very few.

The author divides the treatment into medical, pneumothorax, bronchoscopic drainage, surgical and prophylactic. Postural drainage is emphasized as the best medical treatment. Pneumothorax increases the incidence of pyopneumothorax and so is condemned. The author believes that surgical treatment should not be instituted until six weeks of medical treatment has been tried with no avail.

Since the mortality of lung abscess is about fifty per cent, the author concludes his paper by discussing and stressing the importance of prophylaxis.

—G. WEBSTER, '41.

PHYSIOLOGIC INDICATIONS IN PEPTIC ULCER DIETS

By ALBERT F. R. ANDRESEN, M.D.

Surgery, 5:535, 1939

The author regards peptic ulcer as being divided into complicated and non-complicated. All peptic ulcers that do not heal are considered complicated.

He divides the treatment of non-complicated ulcers into

1. Rest and Diet,
2. Prevention of Recurrences.

This is followed by a detailed account of the required diet. The author claims that if this diet is not effective in relieving discomfort and pain within 24 or 48 hours then the diagnosis is wrong, the patient is allergic to some food in the diet or complications have already developed.

The complications of peptic ulcer are stenosis, hemorrhage and perforation. The first two can be favourably affected by proper diet but, of course, surgery is required for cure in all three. The value in dietetic treatment of stenosis and hemorrhage lies in the fact that these patients require building up before they are suitable operative risks. The author regards a gelatin-milk mixture as the best food following a gastric hemorrhage. This food is given immediately after the hemorrhage. The author believes that this food is to be preferred to the more irritating diets of Meulengracht. However, the principle is the same in both procedures, i.e., to put something into the stomach in order to prevent hunger contractions after the blood clot is vomited and to combine with the acid—both factors which, if not thus combatted, will aggravate the bleeding.

The author uses the same technic in feeding immediately after operation. This method prevents post-operative distension and vomiting.

—F. SYPHER, '41.

A CLINICAL CLASSIFICATION OF CANCER OF THE BREAST

By S. G. SCHENCK, M.D.

Surgery, 5:535, 1939

The author indicates the need for a standard classification of mammary cancer in order to correlate the indications for treatment and the results. Until this is done, it will be impossible to

decide upon the most favourable methods of treatment.

The author then points out the deficiencies of the present classifications before proceeding to present the new one, which is based entirely upon clinical evidence.

There are four stages, depending upon

1. The size of the tumor,
2. The skin involvement,
3. The underlying tissue involvement,
4. Palpable axillary and supraclavicular nodes,
5. Involvement of opposite breast.
6. Distant metastases.

Stage 4 contains all post-operative cases.

The author also points out that this classification has value in determining therapy. Stages 1 and 2 require radical surgery and intense irradiation. In stages 3 and 4 irradiation is the chief factor with any conservative surgery required.

—D. WOODHOUSE, '41.

SULFAPYRIDINE IN THE TREATMENT OF PNEUMONIA IN INFANCY AND CHILDHOOD

By A. T. WILSON, et al.

J.A.M.A., 112:1435, 1939

This is a very comprehensive study of the value of sulfapyridine in treating pneumonia in children. The patients were seventy in number, thirty-five of whom received the drug, while thirty-five were used as a control group.

Since the fatality in pneumonia in infancy is so low the authors did not consider this suitable for comparison. Therefore they used such criteria as severity, fall in temperature, duration of disease, etc. They found that the duration of the disease was shortened by 3 or 4 days. They believe that a concentration of 4 mg. per hundred cubic centimeters of blood is the optimum therapeutic level. They employed doses of 1 to 1½ grains per pound of body weight every 24 hours. The only toxic symptoms noted were cyanosis and vomiting, which were not severe enough to cause concern.

The authors were unable to conclude from this small series whether or not sulfapyridine is effective in preventing the complications of pneumonia.

—B. BROWN, '40.

INSULIN AS A DRESSING FOR CHRONIC INDOLENT ULCERS

By A. R. HUNTER

B.M.J., 4084:773, 1939

The author has tested the recent claims of investigators that insulin used as a dressing promotes epithelialization of chronic skin wounds. A series of ten cases is presented in which a solution of insulin and a second control solution of tricresol were used. The author has shown that insulin is a satisfactory dressing, but no more so than the tricresol solution. It produces no injurious effects, nor does systemic absorption of the insulin occur. Epithelialization is promoted but to no greater extent than with the control.

—R. BERNSTEIN, '39.

RAYNAUD'S DISEASE AND PREGANGLIONIC SYMPATHECTOMY

By THOMAS LEWIS

Clinical Science, 3:3, 1938

The paper is evidence to support Lewis' view that Raynaud's Disease is not primarily the result of abnormal vasomotor tone. Patients still display attacks of loss of circulation to the fingers after sympathectomy. These do not occur in normal people after sympathectomy. Failure of sympathectomy to prevent attacks of Raynaud's phenomenon clearly forbids us from ascribing the original attacks to over-activity of vasomotor tone.

A series of six cases is cited, in all of which preganglionic sympathectomy was done. The cases form a series in the degree of their abnormality before sympathectomy; they form a series of similar order in the degree of abnormality after sympathectomy. The operation has lowered the whole scale of abnormality without appreciably changing the relative position of members of the series, i.e., the result to be expected if the effect of sympathectomy is merely the withdrawal of *normal* sympathetic tone.

The nature of the local fault which is responsible for Raynaud's phenomenon is still obscure. In some cases it is probably a structural change. It is possible that in other cases the increased susceptibility of the vessels to cold is due to sensitization of the vessels by some circulating hormone; possibly it results from some other local influence.

—J. STAPLETON, '41.

THE MECHANISM OF ACTION OF QUININE IN MYOTONIA AND MYASTHENIA

By A. M. HARVEY, M.D.

J.A.M.A., 112:1562, 1939

The author outlines the history of the use of quinine in these two muscular dystrophies. Following a discussion of the theories existing as to the mode of action of quinine the author concludes that as yet its specific action has not yet been discovered.

However, a list of conclusions derived from a study of the pharmacologic action of quinine upon muscle and neuromuscular connections indicates that quinine has a curare-like action which decreases the excitability of the motor end plates. Thus quinine improves myotonia while it increases the severity of myasthenia. On the other hand, physostigmine and potassium chloride have opposite effects and so benefit myasthenia.

After discussing the possibility that these two conditions might be due to disturbances in the whole muscle, the author concludes that this is not so and that the main difficulty lies at the motor end plates.

—H. CLARE, '40.

Editorial

MEDICINE AS YOU LIKE IT

Several times in the past few months representatives of the fourth, fifth and sixth years have been invited to the dean's office. They have been encouraged to discuss, criticize and offer suggestions about the course in Medicine at this university. These informal chats have been of value to both the students and the dean. It is gratifying to the student to be consulted on what he is to be taught. We feel it is a step in the right direction.

REFRESHER COURSE IN ANATOMY

A refresher course in gross anatomy will be given by Drs. H. A. Skinner and M. L. Barr '33 in the Department of Anatomy at the Medical School, beginning about the middle of May and running for a period of five weeks. The course will consist of dissection and a series of 30 lectures on selected topics. A lecture will be given each morning at 10.30. While the object of the course is primarily to assist students who are preparing for the examinations of the Royal College, anyone who desires a refresher course in anatomy is invited to attend. The fee for the course will be $15, payable in advance, and no refund will be allowed for failure to attend. Anyone intending to take the course is requested to register as soon as possible, in any event not later than the first week in May. Further information regarding dates, lectures, etc., may be obtained from the Department of Anatomy, Medical School.

THE HYPOTHALAMUS, MORPHOLOGICAL, FUNCTIONAL, CLINICAL AND SURGICAL ASPECTS

By W. E. Le Gros Clark, F.R.S.; J. Beattie, D.Sc.; G. Riddoch, F.R.C.P., and N. M. Dott, F.R.C.S. (Ed.)

(211 pp., Illustrated, $3.00. Oliver & Boyd, Edinburgh, 1938)

This book is based on four lectures delivered at the University of Edinburgh in 1936, under the auspices of the William Ramsay Henderson Trust.

The anatomy of the hypothalamus in man and lower forms is treated intensively by Le Gros Clark. The material is authoritative, systematically arranged and well illustrated.

The section dealing with the physiology of the hypothalamus was prepared by John Beattie. The function of the hypothalamus in the bodily reactions to heat and cold is stressed, while other important functions of this region are treated very briefly. This section is excellent as an independent lecture. The unilateral presentation of the subject is disappointing, however, particularly in view of the broad treatment accorded the anatomy of the hypothalamus by Clark.

George Riddoch has summarized the clinical aspects of hypothalamic derangement. He has handled a difficult subject concisely and clearly. Most important of all, the presentation is thought provoking and should appeal to the student in clinical years.

Norman Dott describes the surgical aspects of the hypothalamus. Four case histories are given, including an illustrated description of the operative procedures (well illustrated). The main signs of hypothalamic derangement in surgical practice are described concisely.

This book illustrates the advantages of co-operative effort. It merits the attention of the anatomist, physiologist and clinician alike.

TEXTBOOK OF NEURO-ANATOMY AND THE SENSE ORGANS

By O. LARSELL, Ph.D.

Professor of Anatomy, University of Oregon Medical School, Portland

(343 pp., Illustrated, $6.00. D. Appleton-Century Co., 1939)

Larsell's text has been prepared for the medical student who is studying neuro-anatomy for the first time. The arrangement of the material is similar to that found in other standard textbooks. There are many new illustrations of which the drawings of spinal cord and brain stem sections are particularly useful. One half of the drawing is represented as a Weigert stained preparation. The other half of the drawing is schematic in character, representing the various fibre tracts in colour. Two large charts which analyze the fibre tracts of the spinal cord and the main autonomic pathways are valuable summaries. The short chapter dealing with the functions of the thalamus and cerebral cortex is recommended to those who are unlikely to read the book in its entirety.

—M. L. BARR, M.D.